

## Ecological site R102AY006SD Limy Subirrigated

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### General information

**Provisional.** A provisional ecological site description has undergone quality control and quality assurance review. It contains a working state and transition model and enough information to identify the ecological site.

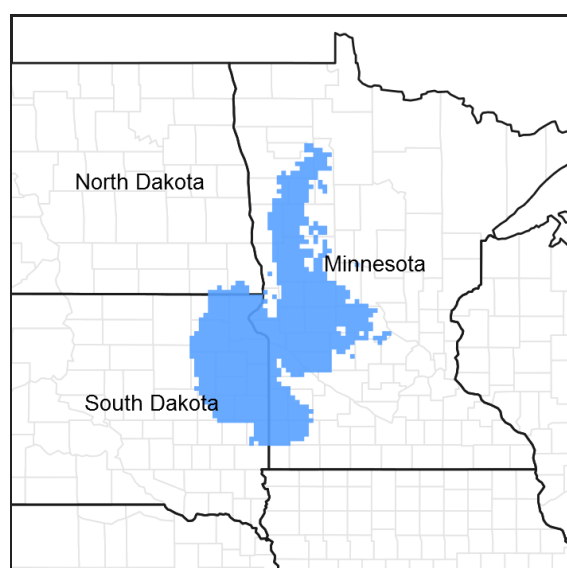


Figure 1. Mapped extent

Areas shown in blue indicate the maximum mapped extent of this ecological site. Other ecological sites likely occur within the highlighted areas. It is also possible for this ecological site to occur outside of highlighted areas if detailed soil survey has not been completed or recently updated.

### MLRA notes

Major Land Resource Area (MLRA): 102A—Rolling Till Prairie

The Rolling Till Prairie (102A) is located within the Central Feed Grains and Livestock Land Resource Region. It spans 3 states (Minnesota 58 percent, South Dakota 42 percent, and small part in North Dakota), encompassing over 16,000 square miles (Figure 1). The elevation ranges from approximately over 2,000 feet above sea level (ASL) on the Prairie Coteau in Northeastern South Dakota to about 1,000 feet ASL on lowlands. The dominate landform in this area are stagnation moraines, end moraines, glacial outwash plains, terraces, and flood plains. The area is dominated by till covered moraines. The stagnation moraines are gently undulating to steep and have many depressions and poorly defined drainages. Small outwash areas are adjacent to the watercourses. The Cretaceous Pierre Shale underlies the till in the most of the area. Precambrian rocks also occur at depth. Granite is quarried near Milbank, South Dakota and outcrops of Sioux Quartzite are common. (USDA-NRCS 2006).

The dominant soil order in this MLRA is Mollisols. The soils in the area dominantly have a frigid soil temperature regime, an aquic or udic soil moisture regime, and mixed mineralogy. They generally are very deep, well drained to very poorly drained. This area supports true prairie vegetation characterized by big bluestem (*Andropogon gerardii*), little bluestem (*Schizachyrium scoparium*), porcupinegrass (*Hesperostipa spartea*), and green needlegrass (*Nassella viridula*). Prairie cordgrass (*Spartina pectinata*) commonly grows in wet areas. (USDA-NRCS 2006).

## Classification relationships

Major Land Resource Area (MLRA): Rolling Till Prairie (102A) (USDA-NRCS 2006)

USFS Subregions: North Central Glaciated Plains Section (251B); Upper Minnesota River-Des Moines Lobe Subsection (251Ba); Outer Coteau des Prairies Subsection (251Bb); Northwest Iowa Plains Subsection (251Bd); Minnesota and Northeast Iowa Morainal-Oak Savannah Section (222M); Alexandria Moraine-Hardwood Hills Subsection (222Ma) (Cleland et al. 2007).

US EPA Level IV Ecoregion: Tewaukon/Big Stone Stagnation Moraine (46e), Prairie Coteau (46k), Prairie Coteau Escarpment (46l), Big Sioux Basin (46m), Minnesota River Prairie (46o), Des Moines Lobe (47b) , Lake Agassiz Plains (48d), Alexandria Moraines and Detroit Lakes Outwash Plain (51j) (USEPA 2013)

## Ecological site concept

The Limy Subirrigated ecological site typically occurs along the edges of drainageways or closed depressions. Soils are somewhat poorly drained which have a water table within 2 to 5 feet of the soil surface that persists longer than the wettest part of the growing season typically until the month of August. Soils will effervesce with acid at or near the surface. Slopes typically range from 0 to 3 percent. Vegetation in the Reference State is dominated by warm season grasses such as Indiangrass, big bluestem, little bluestem. Forbs include goldenrods, cudweed sagewort, heath aster, scurfpea, and western yarrow. Non-native species such as Kentucky bluegrass, smooth brome, and/or quackgrass may invade this site due to a change in disturbance regime.

## Associated sites

R102AY003SD	<b>Subirrigated</b> These sites occur in drainageways. Soils are somewhat poorly drained which have a water table within 2 to 5 feet of the soil surface that persists longer than the wettest part of the growing season typically until the month of August. The central concept soil series is Badger, but other series are included.
R102AY004SD	<b>Wet Meadow</b> These sites occur in a basin or closed depression. Soils are poorly drained and the site ponds water for 4 to 8 weeks in the spring of the year or after a heavy rain. The central concept soil series is Tonka, but other series are included.
R102AY020SD	<b>Loamy Overflow</b> These sites occur in upland swales. Soils are moderately well drained which have water flow into and over/through the site. The central concept soil series is Aastad, Brookings, Svea, and Waubay but other series are included.
R102AY002SD	<b>Linear Meadow</b> These sites occur in drainageways. Soils are poorly and very poorly drained which have a water table within 0 to 2 feet of the soil surface that persists longer than the wettest part of the growing season typically until the month of August. The central concept soil series are Vallers and Colvin, but other series are included.

## Similar sites

R102AY003SD	<b>Subirrigated</b> The Subirrigated site occurs in drainageways. Soils are somewhat poorly drained which have a water table within 2 to 5 feet of the soil surface that persists longer than the wettest part of the growing season typically until the month of August. A Subirrigated site will have more big bluestem, less little bluestem and higher production than a Limy Subirrigated site.
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Table 1. Dominant plant species

Tree	Not specified
Shrub	Not specified
Herbaceous	(1) <i>Sorghastrum nutans</i> (2) <i>Andropogon gerardii</i>

## Physiographic features

The Limy Subirrigated ecological site typically occurs along the edges of drainageways or closed depressions.

**Table 2. Representative physiographic features**

Landforms	(1) Drainageway (2) Closed depression
Flooding duration	Brief (2 to 7 days)
Flooding frequency	Occasional
Elevation	1,000–2,000 ft
Slope	0–3%
Water table depth	30–80 in
Aspect	Aspect is not a significant factor

## Climatic features

MLRA 102A is considered to have a continental climate – cold winters and relatively hot summers, low to moderate humidity, light rainfall, and much sunshine. Extremes in temperature may also abound. The climate is the result of this MLRA's location near the geographic center of North America. There are few natural barriers on the Northern Great Plains and air masses move freely across the plains and account for rapid changes in temperature.

Annual precipitation typically ranges from 21 to 27 inches per year. The average annual temperature is about 43°F. January is the coldest month with average temperatures ranging from about 5°F (Mahnomen 1 W, Minnesota (MN)), to about 14°F (Tracy, MN). July is the warmest month with temperatures averaging from about 69°F (Mahnomen 1 W, MN), to about 73°F (Tracy, MN). The range of normal average monthly temperatures between the coldest and warmest months is about 62°F. This large annual range attests to the continental nature of this area's climate. Hourly winds are estimated to average about 11 miles per hour (mph) annually, ranging from about 13 mph during the spring to about 10 mph during the summer. Daytime winds are generally stronger than nighttime and occasional strong storms may bring brief periods of high winds with gusts to more than 50 mph.

Growth of cool-season plants begins in early to mid-March, slowing or ceasing in late June. Warm-season plants begin growth about mid-May and continue to early or mid-September. Greenup of cool-season plants may occur in September and October when adequate soil moisture is present.

**Table 3. Representative climatic features**

Frost-free period (characteristic range)	112-127 days
Freeze-free period (characteristic range)	137-151 days
Precipitation total (characteristic range)	25-28 in
Frost-free period (actual range)	99-131 days
Freeze-free period (actual range)	130-153 days
Precipitation total (actual range)	24-28 in
Frost-free period (average)	120 days
Freeze-free period (average)	143 days
Precipitation total (average)	26 in

## Climate stations used

- (1) CLARK [USC00391739], Clark, SD
- (2) ROY LAKE [USC00397326], Lake City, SD

- (3) CLEAR LAKE [USC00391777], Clear Lake, SD
- (4) CASTLEWOOD [USC00391519], Castlewood, SD
- (5) MORRIS WC EXP STN [USC00215638], Hancock, MN
- (6) BENSON [USC00210667], Benson, MN
- (7) GLENWOOD 2 WNW [USC00213174], Glenwood, MN
- (8) ARLINGTON 1 W [USC00390281], Arlington, SD
- (9) ARTICHOKE LAKE [USC00210287], Correll, MN
- (10) BROOKINGS 2 NE [USC00391076], Brookings, SD
- (11) BROWNS VALLEY [USC00211063], Beardsley, MN
- (12) FERGUS FALLS [USC00212768], Fergus Falls, MN
- (13) FOSSTON 1 E [USC00212916], Fosston, MN
- (14) LAKE WILSON [USC00214534], Lake Wilson, MN
- (15) MAHNOMEN [USC00215012], Mahnomen, MN
- (16) MELROSE [USC00215325], Melrose, MN
- (17) MILAN 1 NW [USC00215400], Milan, MN
- (18) MILBANK 4 NW [USC00395536], Milbank, SD
- (19) PIPESTONE [USC00216565], Pipestone, MN
- (20) SISSETON [USC00397742], Sisseton, SD
- (21) SUMMIT 1 W [USC00398116], Summit, SD
- (22) TRACY [USC00218323], Tracy, MN
- (23) TYLER [USC00218429], Tyler, MN
- (24) WATERTOWN 1W [USC00398930], Watertown, SD
- (25) WEBSTER [USC00399004], Webster, SD

## Influencing water features

No riparian areas or wetland features are directly associated with this site.

## Soil features

The Limy Subirrigated site typically occurs along the edges of drainageways or closed depressions. Soils are somewhat poorly drained which have a water table within 2 to 5 feet of the soil surface that persists longer than the wettest part of the growing season typically until the month of August. Soils will effervesce with acid at or near the surface. The central concept soil series is Cubden, Divide, Hamerly, and McKranz, but other series are included.

**Table 4. Representative soil features**

Surface texture	(1) Loam (2) Silty clay loam (3) Silt loam
Family particle size	(1) Loamy
Drainage class	Somewhat poorly drained
Permeability class	Moderately slow
Soil depth	80 in
Surface fragment cover <=3"	0–5%
Surface fragment cover >3"	0–2%
Available water capacity (0-40in)	5–8 in
Calcium carbonate equivalent (0-40in)	10–45%
Electrical conductivity (0-40in)	0–4 mmhos/cm
Sodium adsorption ratio (0-40in)	0–2

Soil reaction (1:1 water) (0-40in)	6.6–8.4
Subsurface fragment volume <=3" (Depth not specified)	0–40%
Subsurface fragment volume >3" (Depth not specified)	0–2%

## Ecological dynamics

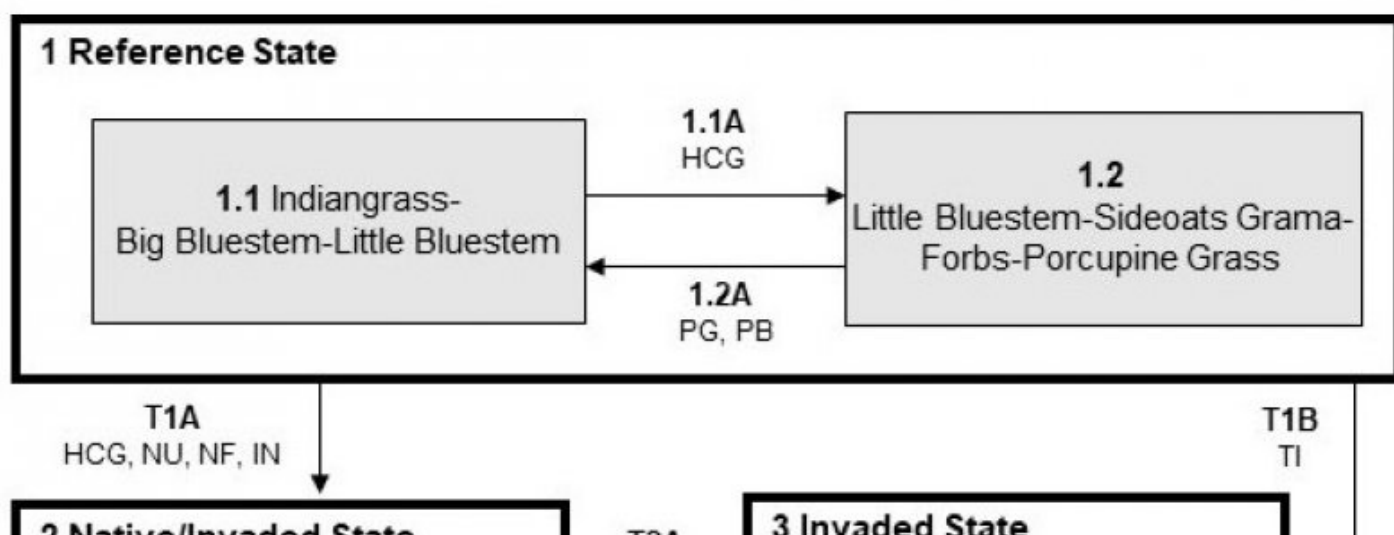
The site which is located in the Prairie Pothole Region developed under Northern Great Plains climatic conditions and included natural influence of large herding herbivores and occasional fire. Changes will occur in the plant communities due to weather fluctuations and/or management actions. Under adverse impacts, a relatively rapid decline in vegetative vigor and composition can occur. Under favorable conditions the site has the potential to resemble the Reference State. Interpretations for this site are based primarily on the 1.1 Indiangrass-Big Bluestem-Little Bluestem Plant Community Phase. This community phase and the Reference State have been determined by study of rangeland relic areas, areas protected from excessive disturbance, and areas under long-term rotational grazing regimes. Trends in plant community dynamics ranging from heavily grazed to lightly grazed areas, seasonal use pastures, and historical accounts also have been considered.

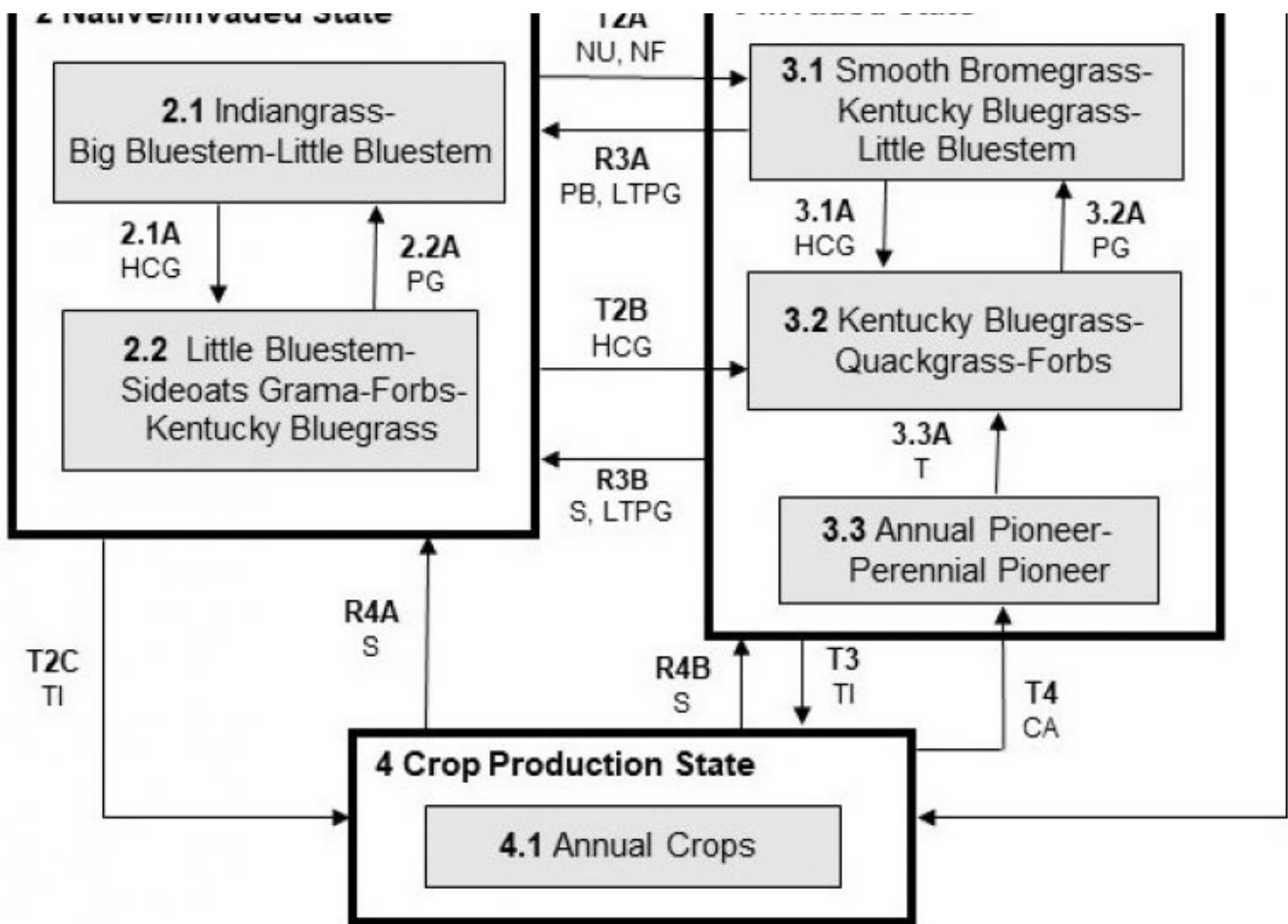
This ecological site (ES) has been grazed by domestic livestock since they have been introduced into the area. The introduction of domestic livestock and the use of fencing and reliable water sources have changed the ecological dynamics of this site. Heavy continuous grazing without adequate recovery periods following each grazing occurrence over several years causes this site to depart from the interpretive plant community. Species such as little bluestem, sideoats grama (*Bouteloua curtipendula*), and blue grama (*Bouteloua gracilis*) will initially increase. Big bluestem, Indiangrass, and switchgrass (*Panicum virgatum*) will decrease in frequency and production. Heavy continuous grazing causes Kentucky bluegrass (*Poa pratensis*) to increase and eventually develop into a sod condition. Extended periods of non-use and no fire will result in a plant community having high litter levels, which favors an increase in Kentucky bluegrass and smooth brome grass (*Bromus inermis*). In time, shrubs such as western snowberry (*Symphoricarpos occidentalis*) will also increase.

Following the state and transition diagram are narratives for each of the described states and community phases. These may not represent every possibility, but they are the most prevalent and repeatable states/community phases. The plant composition tables shown below have been developed from the best available knowledge at the time of this revision. As more data are collected, some of these community phases and/or states may be revised or removed, and new ones may be added. The main purpose for including the descriptions here is to capture the current knowledge and experience at the time of this revision.

## State and transition model

### Limy Subirrigated – MLRA 102A





#### LEGEND

Limy Subirrigated- R102AY006SD

CA – Cropped and abandoned  
HCG – Heavy continuous grazing  
IN – Invasion  
LTPG – Long-term prescribed grazing  
NU – Non-use  
NF – No fire  
PB – Prescribed burning  
PG – Prescribed grazing  
S – Seeding  
T – Time w/wo disturbances  
TI – Tillage

Code	Process
T1A	Heavy continuous grazing, no use, no fire, invasion
T1B	Tillage
T2A	No use, no fire
T2B	Heavy continuous grazing
T2C	Tillage
T3	Tillage
T4	Abandonment of cropping
1.1A	Heavy continuous grazing
1.2A	Prescribed grazing with recovery periods, prescribed burning
2.1A	Heavy continuous grazing
2.2A	Prescribed grazing
3.1A	Heavy continuous grazing
3.2A	Prescribed grazing
3.3A	Time w/wo disturbances
R3A	Long term prescribed grazing, prescribed burning
R3B	Long term prescribed grazing, seeding
R4A	Seeding
R4B	Seeding

## State 1

### Reference State

The Reference State represents the natural range of variability that dominates the dynamics of this ES. This state is typically dominated by warm-season grass and grass-like species. Before European settlement, the primary disturbance mechanisms for this site in the reference condition included periodic fire, grazing by large herding ungulates, and fluctuations in the water table and ponding frequency and duration. Frequent surface fires (3 to 5 years) and grazing coupled with weather events dictated the dynamics that occurred within the natural range of variability. Today, the primary disturbance is from a lack of fire, concentrated livestock grazing, and weather fluctuations. Species that are desirable for livestock and wildlife can decline and a corresponding increase in less desirable species will occur.

## Community 1.1

### Indiangrass-Big Bluestem-Little Bluestem

Interpretations are based primarily on the 1.1 Indiangrass-Big Bluestem-Little Bluestem Plant Community Phase (this is also considered to be climax). This plant community evolved with grazing by large herbivores, frequent surface fires, and periodic flooding events and is suited for grazing by domestic livestock. This plant community can be found on areas that are grazed and where the grazed plants receive adequate periods of rest during the growing season in order to recover. The potential vegetation was about 80 percent grasses or grass-like plants, 15 percent forbs, and 5 percent shrubs. The community was dominated by warm-season grasses. The major grasses included Indiangrass, big bluestem, and little bluestem. Other grass or grass-like species included sideoats grama, porcupine grass (*Hesperostipa spartea*), green needlegrass (*Nassella viridula*), slender wheatgrass (*Elymus trachycaulus*), and sedge. This plant community was resilient and well adapted to the Northern Great Plains climatic conditions. The diversity in plant species allowed for high drought tolerance. This was a sustainable plant community in regards to site/soil stability, watershed function, and biologic integrity.

Table 5. Annual production by plant type

Plant Type	Low (Lb/Acre)	Representative Value (Lb/Acre)	High (Lb/Acre)
Grass/Grasslike	3075	3654	4105
Forb	185	420	755
Shrub/Vine	40	126	240
<b>Total</b>	<b>3300</b>	<b>4200</b>	<b>5100</b>

Figure 9. Plant community growth curve (percent production by month).  
SD0205, Rolling Till Prairie, warm-season dominant.. Warm-season

dominant..

Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
0	0	2	5	15	25	30	15	7	1	0	0

## Community 1.2

### Little Bluestem-Sideoats Grama-Forbs-Porcupine Grass

This plant community evolved under heavy continuous grazing or from over utilization during extended drought periods. The potential plant community was made up of approximately 75 percent grasses and grass-like species, 20 percent forbs, and 5 percent shrubs. Dominant grasses included little bluestem, sideoats grama, and porcupine grass. Grasses of secondary importance included Indiangrass, big bluestem, blue grama, green needlegrass, and slender wheatgrass. Forbs commonly found in this plant community included Canada goldenrod (*Solidago Canadensis*), cudweed sagewort (*Artemisia ludoviciana*), heath aster (*Symphyotrichum ericoides*), scurfpea (*Psoralegium*), stiff goldenrod (*Oligoneuron rigidum*), and western yarrow (*Achillea millefolium*). This plant community had similar plant composition to the 2.2 Little Bluestem-Blue Grama-Forbs-Kentucky Bluegrass Plant Community Phase. The main difference is that this plant community phase did not have the presence of nonnative invasive species such as Kentucky bluegrass and smooth brome grass. When compared to the 1.1 Indiangrass-Big Bluestem-Little Bluestem Plant Community Phase, sideoats grama and little bluestem increased. Production of tall warm-season grasses was reduced. This plant community was moderately resistant to change. The herbaceous species present were well adapted to grazing; however, species composition could be altered through long-term overgrazing. If the herbaceous component was intact, it tended to be resilient if the disturbance was not long-term. Most of the components of the ecological processes would have been functioning at optimum levels. However, the vigor and reproductive capability of the tall warm-season grasses would have been reduced due to grazing pressure or a combination of stressors. A reduction of this dominant functional group allowed for an increase in shorter-statured (and shallower rooted) species.

Figure 10. Plant community growth curve (percent production by month).  
SD0204, Rolling Till Prairie, warm-season dominant, cool-season  
subdominant.. Warm-season dominant, cool-season subdominant..

Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
0	0	3	7	17	25	25	15	7	1	0	0

## Pathway 1.1A

### Community 1.1 to 1.2

Heavy continuous grazing which includes herbivory at moderate to heavy levels at the same time of year each year without adequate recovery periods, or during periods of below normal precipitation when grazing frequency and intensity increases on these sites due to limited forage availability on adjacent upland sites will shift this community to the 1.2 Little Bluestem-Blue Grama-Forbs-Porcupine Grass Plant Community Phase.

## Pathway 1.2A

### Community 1.2 to 1.1

Prescribed Grazing, and/or prescribed burning returned to normal disturbance regime levels and frequencies or periodic light to moderate grazing possibly including periodic rest would have converted this plant community to the 1.1 Indiangrass-Big Bluestem-Little Bluestem Plant Community Phase.

## State 2

### Native/Invaded State

This state represents the more common range of variability that exists with higher levels of grazing management but in the absence of periodic fire due to fire suppression. This state is dominated by warm-season grasses. It can be found on areas that are properly managed with grazing and/or prescribed burning, and sometimes on areas receiving occasional short periods of rest. Taller warm-season species can decline and a corresponding increase in short statured grass will occur.

## Community 2.1

### Indiangrass-Big Bluestem-Little Bluestem

This plant community phase is similar to the 1.1 Indiangrass-Big Bluestem-Little Bluestem Plant Community Phase, but it also contains minor amounts of nonnative invasive grass species such as Kentucky bluegrass and smooth brome grass (up to about 10 percent by air-dry weight). The potential vegetation is about 80 percent grasses or grass-like plants, 15 percent forbs, and 5 percent shrubs. The community is dominated by warm-season grasses. The major grasses include big bluestem, Indiangrass, and little bluestem. Other grass or grass-like species include switchgrass, Canada wildrye (*Elymus Canadensis*), sideoats grama, prairie dropseed (*Sporobolus heterolepis*), slender wheatgrass, and sedges. This plant community is resilient and well adapted to the Northern Great Plains climatic conditions. The diversity in plant species allows for high drought tolerance. This is a sustainable plant community in regards to site/soil stability, watershed function, and biologic integrity.

Figure 11. Plant community growth curve (percent production by month).  
SD0205, Rolling Till Prairie, warm-season dominant.. Warm-season dominant..

Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
0	0	2	5	15	25	30	15	7	1	0	0

## Community 2.2

### Little Bluestem-Sideoats Grama-Forbs-Kentucky Bluegrass

This plant community is a result of heavy continuous grazing or from over utilization during extended drought periods. The potential plant community is made up of approximately 75 percent grasses and grass-like species, 20 percent forbs, and 5 percent shrubs. Dominant grasses include little bluestem, sideoats grama, and Kentucky bluegrass. Grasses of secondary importance included Indiangrass, big bluestem, blue grama, porcupine grass, and slender wheatgrass. Forbs commonly found in this plant community included Canada goldenrod, cudweed, sagewort, heath aster, scurfpea, stiff goldenrod, and western yarrow. When compared to the 1.1 Indiangrass-Big Bluestem-Little Bluestem Plant Community Phase, sideoats grama and little bluestem increased. Production of tall warm-season grasses was reduced. This plant community is moderately resistant to change. The herbaceous species present are well adapted to grazing; however, species composition can be altered through long-term overgrazing. If the herbaceous component is intact, it tends to be resilient if the disturbance is not long-term. Most of the components of the ecological processes are functioning at optimum levels. However, the vigor and reproductive capability of the tall warm-season grasses are reduced due to grazing pressure or a combination of stressors. A reduction of this dominant functional group allows for an increase in shorter-statured (and shallower rooted) species. The introduction of nonnative invasive species such as Kentucky bluegrass and smooth brome grass results in alterations to the soil profile. Organic matter levels tend to decrease and begin to be concentrated more in the surface layers and the structure will begin to be modified. These changes favor the shallow-rooted species and hasten their eventual dominance if steps are not taken to reduce these species.

Table 6. Annual production by plant type

Plant Type	Low (Lb/Acre)	Representative Value (Lb/Acre)	High (Lb/Acre)
Grass/Grasslike	2705	3042	3235
Forb	160	450	865
Shrub/Vine	35	108	200
<b>Total</b>	<b>2900</b>	<b>3600</b>	<b>4300</b>

Figure 13. Plant community growth curve (percent production by month).  
SD0204, Rolling Till Prairie, warm-season dominant, cool-season subdominant.. Warm-season dominant, cool-season subdominant..

Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
0	0	3	7	17	25	25	15	7	1	0	0

## Pathway 2.1A

Community 2.1 to 2.2

Heavy continuous grazing which includes herbivory at moderate to heavy levels at the same time of year each year without adequate recovery periods, or during periods of below normal precipitation when grazing frequency and intensity increases on these sites due to limited forage availability on adjacent upland sites will shift this community to the 2.2 Little Bluestem-Blue Grama-Forbs-Kentucky Bluegrass Plant Community Phase.

Pathway 2.2A  
Community 2.2 to 2.1

Prescribed grazing (alternating season of use and providing adequate recovery periods) or periodic light to moderate grazing possibly including periodic rest will convert this plant community to the 2.1 Indiangrass-Big Bluestem-Little Bluestem Plant Community Phase.

Conservation practices

Prescribed Grazing

State 3  
Invaded State

This state is a result of encroachment mainly by invasive introduced cool-season grasses. The ecological processes are not functioning, especially the biotic processes and the hydrologic functions. The introduced cool-season grasses cause reduced infiltration and increased runoff. Preliminary studies would tend to indicate this threshold may exist when Kentucky bluegrass exceeds 30 percent of the plant community and native grasses represent less than 40 percent of the plant community composition. The opportunity for high intensity spring burns is severely reduced by early greenup and increased moisture and humidity at the soil surface, and grazing pressure cannot cause a reduction in sodgrass dominance. Production is limited to the sod forming species. Infiltration continues to decrease and runoff increases and energy capture into the system is restricted to early season low producing species. Nutrient cycling is limited by root depth of the dominant species.

Community 3.1  
Smooth Bromegrass-Kentucky Bluegrass-Little Bluestem

This plant community phase is a result of extended periods of nonuse and no fire or occasionally light levels of grazing over several years. It is characterized by dominance of smooth bromegrass and Kentucky bluegrass. The dominance is at times so complete that other species are difficult to find on the site. A thick duff layer also accumulates at or above the soil surface and eventually a thatch-mat layer may develop at the surface. Nutrient cycling is greatly reduced and native plants have great difficulty becoming established. When dominated by smooth bromegrass, infiltration is moderately reduced and runoff is moderate. Production can be equal to or higher than the interpretive plant community. However, when dominated by Kentucky bluegrass, infiltration is greatly reduced and runoff is high. Production in this case will likely be significantly less. In either case, the period that palatability is high is relatively short, as these cool-season species mature rapidly. Energy capture is also reduced. The dominance of these introduced species has been shown to alter the biotic component of the soil, as well as organic matter levels and eventually the soil structure. These alterations perpetuate the dominance of Kentucky bluegrass and smooth bromegrass and tend to make establishment of native species extremely difficult.

Table 7. Annual production by plant type

Plant Type	Low (Lb/Acre)	Representative Value (Lb/Acre)	High (Lb/Acre)
Grass/Grasslike	2890	3480	3855
Forb	175	400	720
Shrub/Vine	35	120	225
Total	3100	4000	4800

Figure 15. Plant community growth curve (percent production by month).  
SD0201, Rolling Till Prairie, cool-season dominant.. Cool-season dominant..

Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
0	0	4	12	25	36	10	5	4	4	0	0

## Community 3.2

### Kentucky Bluegrass-Quackgrass-Forbs

This plant community phase is a result of heavy, continuous seasonal grazing or heavy, continuous season-long grazing. It is characterized by a dominance of Kentucky bluegrass and quackgrass (*Elymus repens*). The dominance is at times so complete that other species are difficult to find on the site. A relatively thick duff layer can sometimes accumulate at or above the soil surface and a thatch-mat layer often develops at the surface. Nutrient cycling is greatly reduced and native plants have great difficulty becoming established. Infiltration is greatly reduced and runoff is high. Production will be significantly reduced when compared to the interpretive plant community. The period that palatability is high is relatively short as Kentucky bluegrass matures rapidly. Energy capture is also reduced. Biological activity in the soil is likely reduced significantly in this phase.

Table 8. Annual production by plant type

Plant Type	Low (Lb/Acre)	Representative Value (Lb/Acre)	High (Lb/Acre)
Grass/Grasslike	1395	1980	2500
Forb	205	360	570
Shrub/Vine	0	60	130
<b>Total</b>	<b>1600</b>	<b>2400</b>	<b>3200</b>

Figure 17. Plant community growth curve (percent production by month).  
SD0201, Rolling Till Prairie, cool-season dominant.. Cool-season dominant..

Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
0	0	4	12	25	36	10	5	4	4	0	0

## Community 3.3

### Annual Pioneer-Perennial Pioneer

This plant community developed under continuous heavy grazing or other excessive disturbances. The potential plant community is made up of approximately 40 to 80 percent grasses and grass-like species, 20 to 60 percent forbs, and 0 to 5 percent shrubs. The species present in this phase are highly variable, but often include nonnative invasive and/or early seral species. Plant diversity is low (plant richness may be high, but areas are often dominated by a few species). The ecological processes are difficult to restore because of the loss of plant diversity and overall soil disturbance. Soil erosion is potentially very high because of the bare ground and shallow rooted herbaceous plant community. Water runoff will increase and infiltration will decrease due to animal related soil compaction and loss of root mass due to low plant diversity and vigor. This plant community will require significant economic inputs and time to move towards another plant community. This movement is highly variable in its succession. This is due to the loss of diversity (including the loss of the seed bank), within the existing plant community, and the plant communities on adjacent sites.

## Pathway 3.1A

### Community 3.1 to 3.2

Heavy continuous grazing which includes herbivory at moderate to heavy levels at the same time of year each year without adequate recovery periods, or during periods of below normal precipitation when grazing frequency and intensity increases on these sites due to limited forage availability on adjacent upland sites and no surface fire for extended periods of time (typically for 10 years or more) causing litter levels to become high enough to reduce native grass vigor, diversity, and density will shift this community to the 3.2 Kentucky Bluegrass-Quackgrass-Forbs Plant Community Phase.

## **Pathway 3.2A**

### **Community 3.2 to 3.1**

Prescribed grazing (alternating season of use and providing adequate recovery periods) or periodic light to moderate grazing possibly including periodic rest may convert this plant community to the 3.1 Smooth Brome-grass-Kentucky Bluegrass-Little Bluestem Plant Community Phase.

#### **Conservation practices**

Prescribed Grazing
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## **Pathway 3.3A**

### **Community 3.3 to 3.2**

This community pathway occurs with the passage of time as successional processes take place and perennial plants gradually begin to establish on the site again. This pathway will lead to the 3.2 Kentucky Bluegrass-Quackgrass-Forbs Plant Community Phase.

## **State 4**

### **Crop Production State**

This state is characterized by the production of annual crops using a variety of tillage and cropping systems along with management practices.

### **Community 4.1**

#### **Annual Crops**

This plant community developed with the use of a variety of tillage systems and cropping systems for the production of annual crops including corn, soybeans, wheat, sugar beet and a variety of other crops.

### **Transition T1A**

#### **State 1 to 2**

Non-use and/or no surface fire for extended periods of time (typically for 10 or more years) causing litter levels to become high enough to reduce native grass vigor, diversity, and density, and/or heavy continuous grazing or invasion of non-native plant species will likely lead this state over a threshold resulting in the Native-Invaded State (State 2).

### **Transition T1B**

#### **State 1 to 4**

Tillage will cause a shift over a threshold leading to the 4.1 Annual Crops Plant Community Phase within the Crop Production State (State 4).

### **Transition T2A**

#### **State 2 to 3**

Non-use and/or no surface fire for extended periods of time (typically for 10 or more years) causing litter levels to become high enough to reduce native grass vigor, diversity, and density, will likely lead this state over a threshold leading to the 3.1 Smooth Brome-grass-Kentucky Bluegrass-Little Bluestem Community Phase within the Invaded State (State 3). Heavy continuous grazing (stocking levels well above carrying capacity for extended portions of the growing season and often at the same time of year each year), will likely lead this state over a threshold leading to the 3.2 Kentucky Bluegrass-Quackgrass-Forbs Plant Community Phase within the Invaded State (State 3). Grazing repeatedly in the early growing season can expedite this shift by causing mechanical disturbance due to trampling.

### **Transition T2C**

## State 2 to 4

Tillage will cause a shift over a threshold leading to the 4.1 Annual Crops Plant Community Phase within the Crop Production State (State 4).

## Restoration pathway R3A State 3 to 2

Long-term prescribed grazing (moderate stocking levels coupled with adequate recovery periods, or other grazing systems such as high-density, low-frequency intended to treat specific species dominance, or periodic light to moderate stocking levels possibly including periodic rest) coupled with prescribed burning may lead this 3.1 Smooth Brome-grass-Kentucky Bluegrass-Little Bluestem Plant Community Phase within the Invaded State (State 3) over a threshold to the Native/Invaded State (State 2). Seeding followed by Long-term prescribed grazing (moderate stocking levels coupled with adequate recovery periods, or other grazing systems such as high-density, low-frequency intended to treat specific species dominance, or periodic light to moderate stocking levels possibly including periodic rest) may lead this Invaded State (State 3) over a threshold to the Native/Invaded State (State 2).

## Transition T3 State 3 to 4

Tillage will cause a shift over a threshold leading to the 4.1 Annual Crops Community Phase within the Crop Production State (State 4).

## Restoration pathway R4A State 4 to 2

Seeding may lead this Crop Production State (State 4) over a threshold to the Native/Invaded State (State 2).

## Restoration pathway R4B State 4 to 3

Seeding may lead this Crop Production State (State 4) over a threshold to the Invaded State (State 3). Cropping followed by abandonment may lead this plant community phase over a threshold to the 3.3 Annual Pioneer-Perennial Pioneer Plant Community Phase within the Invaded State (State 3).

## Additional community tables

Table 9. Community 1.1 plant community composition

Group	Common Name	Symbol	Scientific Name	Annual Production (Lb/Acre)	Foliar Cover (%)
<b>Grass/Grasslike</b>					
1	<b>Tall Warm-season Grasses</b>			840–1890	
	Indiangrass	SONU2	<i>Sorghastrum nutans</i>	420–1680	–
	big bluestem	ANGE	<i>Andropogon gerardii</i>	210–1470	–
	switchgrass	PAVI2	<i>Panicum virgatum</i>	0–210	–
2	<b>Mid Warm-season Grasses</b>			630–1260	
	little bluestem	SCSC	<i>Schizachyrium scoparium</i>	420–1260	–
	sideoats grama	BOCU	<i>Bouteloua curtipendula</i>	84–630	–
	prairie dropseed	SPHE	<i>Sporobolus heterolepis</i>	0–210	–
3	<b>Cool-season Grasses</b>			210–1050	
	porcupinegrass	HESP11	<i>Hesperostipa spartea</i>	84–840	–
	green needlegrass	NAVI4	<i>Nassella viridula</i>	42–420	–
	Canada wildrye	ELCA4	<i>Elymus canadensis</i>	42–210	–
	slender wheatgrass	ELTR7	<i>Elymus trachycaulus</i>	42–210	–

	scribner wheatgrass	LETH	<i>Elymus trachycephalus</i>	42–210	–
	western wheatgrass	PASM	<i>Pascopyrum smithii</i>	0–126	–
	northern reedgrass	CAST13	<i>Calamagrostis stricta</i> ssp. <i>inexpansa</i>	0–126	–
4	<b>Other Native Grasses</b>			42–210	
	Graminoid (grass or grass-like)	2GRAM	<i>Graminoid (grass or grass-like)</i>	42–168	–
	blue grama	BOGR2	<i>Bouteloua gracilis</i>	0–168	–
	Scribner's rosette grass	DIOLS	<i>Dichanthelium oligosanthes</i> var. <i>scribnerianum</i>	0–42	–
	prairie Junegrass	KOMA	<i>Koeleria macrantha</i>	0–42	–
5	<b>Grass-likes</b>			42–210	
	sedge	CAREX	<i>Carex</i>	42–210	–
	spikerush	ELEOC	<i>Eleocharis</i>	0–126	–
	Grass-like (not a true grass)	2GL	<i>Grass-like (not a true grass)</i>	0–84	–
<b>Forb</b>					
6	<b>Forbs</b>			210–630	
	Forb, native	2FN	<i>Forb, native</i>	42–168	–
	white sagebrush	ARLU	<i>Artemisia ludoviciana</i>	42–126	–
	goldenrod	SOLID	<i>Solidago</i>	42–126	–
	white heath aster	SYER	<i>Symphyotrichum ericoides</i>	42–84	–
	New England aster	SYNO2	<i>Symphyotrichum novae-angliae</i>	0–84	–
	western marbleseed	ONBEO	<i>Onosmodium bejariense</i> var. <i>occidentale</i>	42–84	–
	Norwegian cinquefoil	PONO3	<i>Potentilla norvegica</i>	42–84	–
	blackeyed Susan	RUHI2	<i>Rudbeckia hirta</i>	0–84	–
	Indianhemp	APCA	<i>Apocynum cannabinum</i>	42–84	–
	meadow zizia	ZIAP	<i>Zizia aptera</i>	42–84	–
	tall blazing star	LIAS	<i>Liatris aspera</i>	42–84	–
	American licorice	GLLE3	<i>Glycyrrhiza lepidota</i>	42–84	–
	Maximilian sunflower	HEMA2	<i>Helianthus maximiliani</i>	42–84	–
	stiff sunflower	HEPA19	<i>Helianthus pauciflorus</i>	42–84	–
	western yarrow	ACMIO	<i>Achillea millefolium</i> var. <i>occidentalis</i>	0–84	–
	purple prairie clover	DAPU5	<i>Dalea purpurea</i>	42–84	–
	smooth horsetail	EQLA	<i>Equisetum laevigatum</i>	0–42	–
	Virginia strawberry	FRVI	<i>Fragaria virginiana</i>	0–42	–
	closed bottle gentian	GEAN	<i>Gentiana andrewsii</i>	0–42	–
	downy gentian	GEPU5	<i>Gentiana puberulenta</i>	0–42	–
	Cuman ragweed	AMPS	<i>Ambrosia psilostachya</i>	0–42	–
	Canadian anemone	ANCA8	<i>Anemone canadensis</i>	0–42	–
	common goldstar	HYHI2	<i>Hypoxis hirsuta</i>	0–42	–
	palespike lobelia	LOSP	<i>Lobelia spicata</i>	0–42	–
	rough bugleweed	LYAS	<i>Lycopus asper</i>	0–42	–
	bluebell bellflower	CARO2	<i>Campanula rotundifolia</i>	0–42	–
	blue-eyed grass	SISYR	<i>Sisyrinchium</i>	0–42	–
	upright prairie coneflower	RACO3	<i>Ratibida columnifera</i>	0–42	–

	prairie violet	VIPE2	<i>Viola pedatifida</i>	0–42	–
<b>Shrub/Vine</b>					
7	<b>Shrubs</b>			42–210	
	leadplant	AMCA6	<i>Amorpha canescens</i>	42–168	–
	rose	ROSA5	<i>Rosa</i>	0–84	–
	willow	SALIX	<i>Salix</i>	0–84	–
	snowberry	SYMPH	<i>Symphoricarpos</i>	0–84	–
	Shrub (>.5m)	2SHRUB	<i>Shrub (&gt;.5m)</i>	0–84	–

Table 10. Community 2.2 plant community composition

Group	Common Name	Symbol	Scientific Name	Annual Production (Lb/Acre)	Foliar Cover (%)
<b>Grass/Grasslike</b>					
1	<b>Tall Warm-season Grasses</b>			72–540	
	big bluestem	ANGE	<i>Andropogon gerardii</i>	0–360	–
	Indiangrass	SONU2	<i>Sorghastrum nutans</i>	0–360	–
	switchgrass	PAVI2	<i>Panicum virgatum</i>	0–108	–
2	<b>Mid Warm-season Grasses</b>			540–1440	
	little bluestem	SCSC	<i>Schizachyrium scoparium</i>	360–1260	–
	sideoats grama	BOCU	<i>Bouteloua curtipendula</i>	180–648	–
3	<b>Cool-season Grasses</b>			36–360	
	porcupinegrass	HESP11	<i>Hesperostipa spartea</i>	0–180	–
	slender wheatgrass	ELTR7	<i>Elymus trachycaulus</i>	0–144	–
	Canada wildrye	ELCA4	<i>Elymus canadensis</i>	0–108	–
	green needlegrass	NAVI4	<i>Nassella viridula</i>	0–108	–
	western wheatgrass	PASM	<i>Pascopyrum smithii</i>	0–72	–
4	<b>Other Native Grasses</b>			72–360	
	blue grama	BOGR2	<i>Bouteloua gracilis</i>	36–252	–
	Graminoid (grass or grass-like)	2GRAM	<i>Graminoid (grass or grass-like)</i>	36–144	–
	Scribner's rosette grass	DIOLS	<i>Dichanthelium oligosanthos</i> var. <i>scribnerianum</i>	0–72	–
	prairie Junegrass	KOMA	<i>Koeleria macrantha</i>	0–36	–
5	<b>Grass-likes</b>			36–180	
	sedge	CAREX	<i>Carex</i>	36–180	–
	spikerush	ELEOC	<i>Eleocharis</i>	0–144	–
	Grass-like (not a true grass)	2GL	<i>Grass-like (not a true grass)</i>	0–72	–
6	<b>Non-Native Grasses</b>			180–540	
	Kentucky bluegrass	POPR	<i>Poa pratensis</i>	180–540	–
	smooth brome	BRIN2	<i>Bromus inermis</i>	0–252	–
	quackgrass	ELRE4	<i>Elymus repens</i>	0–180	–
	reed canarygrass	PHAR3	<i>Phalaris arundinacea</i>	0–180	–
<b>Forb</b>					
7	<b>Forbs</b>			180–720	

	goldenrod	SOLID	<i>Solidago</i>	36–216	–
	white sagebrush	ARLU	<i>Artemisia ludoviciana</i>	36–180	–
	Cuman ragweed	AMPS	<i>Ambrosia psilostachya</i>	36–144	–
	Indianhemp	APCA	<i>Apocynum cannabinum</i>	36–108	–
	Forb, introduced	2FI	<i>Forb, introduced</i>	36–108	–
	Forb, native	2FN	<i>Forb, native</i>	0–108	–
	western yarrow	ACMIO	<i>Achillea millefolium</i> var. <i>occidentalis</i>	36–108	–
	American licorice	GLLE3	<i>Glycyrrhiza lepidota</i>	36–108	–
	white heath aster	SYER	<i>Symphyotrichum ericoides</i>	36–108	–
	New England aster	SYNO2	<i>Symphyotrichum novae-angliae</i>	0–108	–
	western marbleseed	ONBEO	<i>Onosmodium bejariense</i> var. <i>occidentale</i>	0–108	–
	tall blazing star	LIAS	<i>Liatris aspera</i>	0–72	–
	rough bugleweed	LYAS	<i>Lycopus asper</i>	0–36	–
	Norwegian cinquefoil	PONO3	<i>Potentilla norvegica</i>	0–36	–
	blackeyed Susan	RUHI2	<i>Rudbeckia hirta</i>	0–36	–
	meadow zizia	ZIAP	<i>Zizia aptera</i>	0–36	–
	Maximilian sunflower	HEMA2	<i>Helianthus maximiliani</i>	0–36	–
	stiff sunflower	HEPA19	<i>Helianthus pauciflorus</i>	0–36	–
	purple prairie clover	DAPU5	<i>Dalea purpurea</i>	0–36	–
	smooth horsetail	EQLA	<i>Equisetum laevigatum</i>	0–36	–
<b>Shrub/Vine</b>					
8	<b>Shrubs</b>			36–180	
	snowberry	SYMPH	<i>Symphoricarpos</i>	36–144	–
	Shrub (>.5m)	2SHRUB	<i>Shrub (&gt;.5m)</i>	0–72	–
	leadplant	AMCA6	<i>Amorpha canescens</i>	0–72	–
	rose	ROSA5	<i>Rosa</i>	0–72	–
	willow	SALIX	<i>Salix</i>	0–36	–

Table 11. Community 3.1 plant community composition

Group	Common Name	Symbol	Scientific Name	Annual Production (Lb/Acre)	Foliar Cover (%)
<b>Grass/Grasslike</b>					
1	<b>Tall Warm-season Grasses</b>			0–200	
	big bluestem	ANGE	<i>Andropogon gerardii</i>	0–120	–
	Indiangrass	SONU2	<i>Sorghastrum nutans</i>	0–120	–
	switchgrass	PAVI2	<i>Panicum virgatum</i>	0–80	–
2	<b>Mid Warm-season Grasses</b>			0–800	
	little bluestem	SCSC	<i>Schizachyrium scoparium</i>	0–800	–
	sideoats grama	BOCU	<i>Bouteloua curtipendula</i>	0–240	–
3	<b>Cool-season Grasses</b>			0–400	
	green needlegrass	NAVI4	<i>Nassella viridula</i>	0–320	–
	porcupinegrass	HESP11	<i>Hesperostipa spartea</i>	0–200	–
	slender wheatgrass	ELTR7	<i>Elymus trachycaulus</i>	0–120	–
	Canada wildrye	ELCA4	<i>Elymus canadensis</i>	0–40	–

	western wheatgrass	PASM	<i>Pascopyrum smithii</i>	0–40	–
4	<b>Other Native Grasses</b>			0–200	
	Graminoid (grass or grass-like)	2GRAM	<i>Graminoid (grass or grass-like)</i>	0–160	–
	blue grama	BOGR2	<i>Bouteloua gracilis</i>	0–120	–
	Scribner's rosette grass	DIOLS	<i>Dichanthelium oligosanthes</i> var. <i>scribnerianum</i>	0–40	–
	prairie Junegrass	KOMA	<i>Koeleria macrantha</i>	0–40	–
5	<b>Grass-likes</b>			40–200	
	sedge	CAREX	<i>Carex</i>	40–200	–
	spikerush	ELEOC	<i>Eleocharis</i>	0–160	–
	Grass-like (not a true grass)	2GL	<i>Grass-like (not a true grass)</i>	0–80	–
6	<b>Non-Native Grasses</b>			1000–2400	
	smooth brome	BRIN2	<i>Bromus inermis</i>	600–2200	–
	Kentucky bluegrass	POPR	<i>Poa pratensis</i>	400–1400	–
	reed canarygrass	PHAR3	<i>Phalaris arundinacea</i>	0–600	–
	quackgrass	ELRE4	<i>Elymus repens</i>	0–120	–
<b>Forb</b>					
7	<b>Forbs</b>			200–600	
	white sagebrush	ARLU	<i>Artemisia ludoviciana</i>	40–200	–
	goldenrod	SOLID	<i>Solidago</i>	40–200	–
	Forb, introduced	2FI	<i>Forb, introduced</i>	40–160	–
	New England aster	SYNO2	<i>Symphyotrichum novae-angliae</i>	0–160	–
	Forb, native	2FN	<i>Forb, native</i>	0–120	–
	Cuman ragweed	AMPS	<i>Ambrosia psilostachya</i>	40–120	–
	American licorice	GLLE3	<i>Glycyrrhiza lepidota</i>	40–120	–
	white heath aster	SYER	<i>Symphyotrichum ericoides</i>	40–120	–
	Indianhemp	APCA	<i>Apocynum cannabinum</i>	0–80	–
	western yarrow	ACMIO	<i>Achillea millefolium</i> var. <i>occidentalis</i>	0–80	–
	tall blazing star	LIAS	<i>Liatris aspera</i>	0–40	–
	rough bugleweed	LYAS	<i>Lycopus asper</i>	0–40	–
	western marbleseed	ONBEO	<i>Onosmodium bejariense</i> var. <i>occidentale</i>	0–40	–
	Norwegian cinquefoil	PONO3	<i>Potentilla norvegica</i>	0–40	–
	smooth horsetail	EQLA	<i>Equisetum laevigatum</i>	0–40	–
<b>Shrub/Vine</b>					
8	<b>Shrubs</b>			40–200	
	snowberry	SYMPH	<i>Symphoricarpos</i>	40–200	–
	rose	ROSA5	<i>Rosa</i>	0–80	–
	willow	SALIX	<i>Salix</i>	0–80	–
	Shrub (>.5m)	2SHRUB	<i>Shrub (&gt;.5m)</i>	0–80	–
	leadplant	AMCA6	<i>Amorpha canescens</i>	0–40	–

Table 12. Community 3.2 plant community composition

Group	Common Name	Symbol	Scientific Name	Annual Production (Lb/Acre)	Foliar Cover (%)
<b>Grass/Grasslike</b>					
1	<b>Tall Warm-season Grasses</b>			0–48	
	big bluestem	ANGE	<i>Andropogon gerardii</i>	0–48	–
	switchgrass	PAVI2	<i>Panicum virgatum</i>	0–24	–
2	<b>Mid Warm-season Grasses</b>			0–120	
	little bluestem	SCSC	<i>Schizachyrium scoparium</i>	0–120	–
	sideoats grama	BOCU	<i>Bouteloua curtipendula</i>	0–72	–
3	<b>Cool-season Grasses</b>			0–72	
	western wheatgrass	PASM	<i>Pascopyrum smithii</i>	0–72	–
	green needlegrass	NAVI4	<i>Nassella viridula</i>	0–48	–
4	<b>Other Native Grasses</b>			0–168	
	blue grama	BOGR2	<i>Bouteloua gracilis</i>	0–144	–
	Graminoid (grass or grass-like)	2GRAM	<i>Graminoid (grass or grass-like)</i>	0–72	–
	Scribner's rosette grass	DIOLS	<i>Dichanthelium oligosanthos</i> var. <i>scribnerianum</i>	0–24	–
5	<b>Grass-likes</b>			24–192	
	sedge	CAREX	<i>Carex</i>	24–168	–
	spikerush	ELEOC	<i>Eleocharis</i>	0–120	–
	Grass-like (not a true grass)	2GL	<i>Grass-like (not a true grass)</i>	0–48	–
6	<b>Non-Native Grasses</b>			720–1680	
	Kentucky bluegrass	POPR	<i>Poa pratensis</i>	480–1440	–
	quackgrass	ELRE4	<i>Elymus repens</i>	24–240	–
	reed canarygrass	PHAR3	<i>Phalaris arundinacea</i>	0–120	–
	smooth brome	BRIN2	<i>Bromus inermis</i>	0–120	–
<b>Forb</b>					
7	<b>Forbs</b>			240–480	
	goldenrod	SOLID	<i>Solidago</i>	24–192	–
	Forb, introduced	2FI	<i>Forb, introduced</i>	24–168	–
	white sagebrush	ARLU	<i>Artemisia ludoviciana</i>	24–168	–
	Cuman ragweed	AMPS	<i>Ambrosia psilostachya</i>	24–120	–
	western yarrow	ACMIO	<i>Achillea millefolium</i> var. <i>occidentalis</i>	24–96	–
	New England aster	SYNO2	<i>Symphyotrichum novae-angliae</i>	0–96	–
	white heath aster	SYER	<i>Symphyotrichum ericoides</i>	24–72	–
	Indianhemp	APCA	<i>Apocynum cannabinum</i>	0–72	–
	Forb, native	2FN	<i>Forb, native</i>	0–48	–
	American licorice	GLLE3	<i>Glycyrrhiza lepidota</i>	0–48	–
	Norwegian cinquefoil	PONO3	<i>Potentilla norvegica</i>	0–24	–
	smooth horsetail	EQLA	<i>Equisetum laevigatum</i>	0–24	–
<b>Shrub/Vine</b>					
8	<b>Shrubs</b>			0–120	
	snowberry	SYMPH	<i>Symphoricarpos</i>	0–120	–
	Shrub (S. 5m)	2SOLID	<i>Shrub (S. 5m)</i>	0–48	–

	SHRUB (>.5m)	ЗШРКУБ	SHRUB (>.5m)	0-48	-
	rose	ROSA5	Rosa	0-24	-

## Animal community

### Animal Community – Grazing Interpretations

The following table lists annual, suggested initial stocking rates with average growing conditions. These are conservative estimates that should be used only as guidelines in the initial stages of conservation planning. Often, the current plant composition does not entirely match any particular plant community (as described in this ES description). Because of this, a resource inventory is necessary to document plant composition and production. More accurate carrying capacity estimates should eventually be calculated using the following stocking rate information along with animal preference data and actual stocking records, particularly when grazers other than cattle are involved. With consultation of the land manager, more intensive grazing management may result in improved harvest efficiencies and increased carrying capacity.

#### Indiangrass/Big Bluestem/Little Bluestem (1.1 & 2.1)

Average Annual Production (lbs./acre, air-dry):

4200

Stocking Rate\* (AUM/acre): 1.15

#### Little Bluestem/Grama/Forbs/Kentucky Bluegrass (2.2)

Average Annual Production (lbs./acre, air-dry):

3600

Stocking Rate\* (AUM/acre): 0.99

#### Smooth Bromeagrass/Kentucky Bluegrass/Little Bluestem (3.1)

Average Annual Production (lbs./acre, air-dry):

4000

Stocking Rate\* (AUM/acre): 1.10

#### Kentucky Bluegrass/Quackgrass/Forbs (3.2)

Average Annual Production (lbs./acre, air-dry):

2400

Stocking Rate\* (AUM/acre): 0.66

#### Annual/Pioneer, Non-Native Perennial (3.3)

Average Annual Production (lbs./acre, air-dry):

1200

Stocking Rate\* (AUM/acre): 0.33

\*Based on 912 lbs./acre (air-dry weight) per Animal Unit Month (AUM), and on 25 percent harvest efficiency (refer to United States Department of Agriculture (USDA) Natural Resources Conservation Service (NRCS), National Range and Pasture Handbook).

Grazing by domestic livestock is one of the major income-producing industries in the area. Rangeland in this area may provide yearlong forage. During the dormant period, the forage for livestock will likely be lacking protein to meet livestock requirements and added protein will allow ruminants to better utilize the energy stored in grazed plant materials. A forage quality test (either directly or through fecal sampling) should be used to determine the level of supplementation needed.

## Hydrological functions

Water is the principal factor limiting forage production on this site. This site is dominated by soils in hydrologic groups B and C. Infiltration is typically moderately slow and runoff potential for this site varies from negligible to low depending on soil hydrologic group, slope, and ground cover. In many cases, areas with greater than 75 percent ground cover have the greatest potential for higher infiltration and lower runoff. An example of an exception would be where shortgrasses form a strong sod and dominate the site. Dominance by Kentucky bluegrass and/or smooth bromeagrass will result in reduced infiltration and increased runoff. Areas where ground cover is less than 50 percent

have the greatest potential to have reduced infiltration and higher runoff (refer to Section 4, NRCS National Engineering Handbook for runoff quantities and hydrologic curves).

## **Recreational uses**

This site provides hunting, hiking, photography, bird watching, and other opportunities. The wide varieties of plants that bloom from spring until fall have an esthetic value that appeals to visitors.

## **Wood products**

No appreciable wood products are typically present on this site.

## **Other products**

Seed harvest of native plant species can provide additional income on this site.

## **Inventory data references**

Information presented here has been derived from NRCS clipping data and other inventory data. Field observations from range-trained personnel were also used. Those involved in developing this site include: Stan Boltz, Range Management Specialist, NRCS; and Bruce Kunze, Soil Scientist, NRCS.

Data Source	Sample Period	State	County
NP-ECS-1 (0010746039)	2007	SD	Deuel
NP-ECS-1 (0130746039)	2007	SD	Deuel

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Rangeland health reference sheet

Interpreting Indicators of Rangeland Health is a qualitative assessment protocol used to determine ecosystem condition based on benchmark characteristics described in the Reference Sheet. A suite of 17 (or more) indicators are typically considered in an assessment. The ecological site(s) representative of an assessment location must be known prior to applying the protocol and must be verified based on soils and climate. Current plant community cannot be used to identify the ecological site.

Author(s)/participant(s)	David Schmidt, Tim Nordquist, Stan Boltz
Contact for lead author	
Date	12/04/2007
Approved by	Suzanne Mayne-Kinney
Approval date	
Composition (Indicators 10 and 12) based on	Annual Production

Indicators

1. **Number and extent of rills:** Rills should not be present.
2. **Presence of water flow patterns:** Barely observable.
3. **Number and height of erosional pedestals or terracettes:** Essentially, non-existent.
4. **Bare ground from Ecological Site Description or other studies (rock, litter, lichen, moss, plant canopy are not bare ground):** Bare ground less than 5% and less than 2 inches in diameter.

5. **Number of gullies and erosion associated with gullies:** Active gullies should not be present.
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6. **Extent of wind scoured, blowouts and/or depositional areas:** None.
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7. **Amount of litter movement (describe size and distance expected to travel):** Little to no plant litter movement. Plant litter remains in place and is not moved by erosional forces.
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8. **Soil surface (top few mm) resistance to erosion (stability values are averages - most sites will show a range of values):** Stability class usually 6. Typically high root content, organic matter, and granular structure. Soil surface is very resistant to erosion.
- 
9. **Soil surface structure and SOM content (include type of structure and A-horizon color and thickness):** Use soil series description for depth and color of A-horizon.
- 
10. **Effect of community phase composition (relative proportion of different functional groups) and spatial distribution on infiltration and runoff:** Healthy, deep rooted native grasses enhance infiltration and reduce runoff.
- 
11. **Presence and thickness of compaction layer (usually none; describe soil profile features which may be mistaken for compaction on this site):** No compaction layer should be evident.
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12. **Functional/Structural Groups (list in order of descending dominance by above-ground annual-production or live foliar cover using symbols: >>, >, = to indicate much greater than, greater than, and equal to):**
- Dominant: Mid warm-season bunch grass >> tall warm-season rhizomatous grass
- Sub-dominant: > tall cool-season bunch grass > mid cool-season rhizomatous grass > short cool-season grass = forb
- Other:
- Additional:
- 
13. **Amount of plant mortality and decadence (include which functional groups are expected to show mortality or decadence):** Very little to no evidence of decadence or mortality.
- 
14. **Average percent litter cover (%) and depth ( in):** 85-90%, roughly 0.5 inch thick or less. Litter cover is in contact with soil surface.
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15. **Expected annual annual-production (this is TOTAL above-ground annual-production, not just forage annual-production):** 3800 – 5000 lbs./acre air-dry weight, average 4,400 lbs./acre air-dry weight

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16. **Potential invasive (including noxious) species (native and non-native).** List species which BOTH characterize degraded states and have the potential to become a dominant or co-dominant species on the ecological site if their future establishment and growth is not actively controlled by management interventions. Species that become dominant for only one to several years (e.g., short-term response to drought or wildfire) are not invasive plants. Note that unlike other indicators, we are describing what is NOT expected in the reference state for the ecological site: Refer to State and Local Noxious Weed List
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17. **Perennial plant reproductive capability:** All species are capable of reproducing.
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